

## Complete Summary

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### GUIDELINE TITLE

Ultrasonographic examinations: indications and preparation of the patient.

### BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Ultrasonographic examinations: indications and preparation of the patient. In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2007 Jan 11 [Various].

### GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Ultrasonographic examinations: indications and preparation of the patient. In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2005 Jan 2 [Various].

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 INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT  
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## SCOPE

### DISEASE/CONDITION(S)

- Ascites
- Abdominal infections
- Diseases of the pancreas, liver, gallbladder, kidney, adrenal gland, spleen, urinary bladder, and prostate
- Aortic aneurysm and dissection
- Blood vessel diseases and complications of vascular surgery
- Pleural or pericardial effusion
- Thyroid nodules

- Injuries to soft tissues and joints of the extremities
- Diseases of the testis and epididymis
- Cysts, hematomas, abscesses, and tumors

#### GUIDELINE CATEGORY

Diagnosis  
Evaluation

#### CLINICAL SPECIALTY

Family Practice  
Internal Medicine  
Radiology

#### INTENDED USERS

Health Care Providers  
Physicians

#### GUIDELINE OBJECTIVE(S)

Evidence-Based Medicine Guidelines collects, summarizes, and updates the core clinical knowledge essential in general practice. The guidelines also describe the scientific evidence underlying the given recommendations.

#### TARGET POPULATION

Individuals with suspected clinical problems that can be diagnosed or evaluated through ultrasonographic examination

#### INTERVENTIONS AND PRACTICES CONSIDERED

1. Patient preparation (no eating for 6 hours or drinking for 2 hours before examination/fasting for gallbladder examinations)
2. Abdominal ultrasonography
3. Computed tomography
4. Magnetic resonance imaging
5. Ultrasonography of the blood vessels
6. Thoracic ultrasonography
7. Thyroid and parathyroid ultrasonography
8. Ultrasonography of soft tissues and joints of the extremities
9. Ultrasonography of the testis and epididymis
10. Ultrasonographically guided biopsies and punctures
11. Ultrasonographically guided placement of central venous catheters

#### MAJOR OUTCOMES CONSIDERED

- Accuracy of diagnosis
- Sensitivity and specificity of ultrasound in diagnosis of acute appendicitis

- Sensitivity and specificity of ultrasound in diagnosis of arterial disease of the lower extremities
- Sensitivity and positive predictive value of ultrasound in screening for deep vein thrombosis in asymptomatic postoperative patients
- Accurate placement of central venous catheters and number of complications related to placement

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)  
 Hand-searches of Published Literature (Secondary Sources)  
 Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The evidence reviewed was collected from the Cochrane database of systematic reviews and the database of abstracts of reviews of effectiveness (DARE). In addition, the Cochrane Library and medical journals were searched specifically for original publications.

### NUMBER OF SOURCE DOCUMENTS

Not stated

### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

- A. Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
- B. Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
- C. Limited research-based evidence. At least one adequate scientific study.
- D. No research-based evidence. Expert panel evaluation of other information.

### METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses  
 Systematic Review

### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

## METHOD OF GUIDELINE VALIDATION

Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

The levels of evidence [A-D] supporting the recommendations are defined at the end of the "Major Recommendations" field.

#### Abdominal Ultrasonography

##### Patient Preparation

- The patient should not eat for 6 hours and drink for 2 hours before the examination.
- Fasting is necessary when examining the gallbladder because eating causes a contraction of the bladder. In other indications, the effect of eating or drinking is minimal or null.
- In emergency cases, the examination can be performed without preparations.

##### Upper Abdomen

- Includes the liver, gallbladder, biliary tract, pancreas, spleen, kidneys, aorta, and retroperitoneal space (for details see below)

##### Ascites

- Clinically suspected ascites can be confirmed. Ascites formation may be due to heart failure, cirrhosis of the liver, nephrotic syndrome or a tumour.

- Scant ascites is most easily detected between the right kidney and liver where it forms a crescent-shaped fluid collection. Look for ascites also in the lower abdomen around the urinary bladder where small amounts of fluid often accumulate.

### Abdominal Infections

- Ultrasonography may be helpful in detecting acute infection or peritonitis (free fluid or gas in the abdominal cavity) when the indications for surgery are determined. Peritonitis is difficult to detect because decreased intestinal motility may make the visibility extremely bad.
- When intra-abdominal abscess as a complication of abdominal surgery or appendicitis (Orr, Porter, & Hartman, 1995) [B] is suspected. However, a computed tomography (CT) scan is often required.
- Ultrasonography is not a routine examination in suspected acute appendicitis because of its inaccuracy (even if the inflamed appendix can often be seen) (Orr, Porter, & Hartman, 1999) [B].

### Pancreas

- Included in the upper abdominal examination
- Indications
  - Suspicion of moderate or severe pancreatitis
  - Suspicion of a pancreatic pseudocyst
  - Suspicion of pancreatic carcinoma
- Pancreatic ultrasonography is rather insensitive and has many sources of error. Lying a longer time in supine position may cause the intestinal gas to accumulate and shadow the retroperitoneum in an unfavorable manner. It is recommendable to try also other positions (tilting in different directions, sitting) to help in examining the pancreas that may sometimes be difficult to discern.

### Liver

- Included in the upper abdominal examination
- All liver diseases: hepatomegaly, cirrhosis, tumours and metastases, cysts and abscesses, biliary obstruction, abdominal trauma, jaundice
- Cirrhosis and fatty change of the liver increase the echo intensity of the liver. The renal cortex provides a good reference point because it normally has similar density to the liver.
- The sensitivity in the diagnosis of cirrhosis is probably poor. The liver may be smaller than usual, with poorly defined borders and uneven echogenicity. Ascites and collateral vessels may be detected in the terminal phase.

### Kidneys and Adrenal Glands

- Included in the upper abdominal examination
- Diagnostics of renal tumours, cysts (Kearon et al., 1998), polycystic kidney disease, hydronephrosis and traumas; examination of a silent kidney observed in urography
- Adrenal adenomas can often be diagnosed (but not excluded) by ultrasonography.

- Primary examination in children with urinary tract infection to exclude structural abnormalities
- No preparations are needed.
- In the assessment of recurrent abdominal pain in children the patient should not eat for 6 hours and drink for 2 hours before elective examination.

#### Spleen

- Included in the upper abdominal examination
- Splenomegaly, ruptured spleen in abdominal trauma. Ultrasonography is not sensitive in detecting ruptures so a suspicion of such requires clinical follow-up even if the finding is normal, repetition of the ultrasonography in unclear cases and ready use of other imaging techniques (computed tomography [CT], magnetic resonance imaging [MRI]).

#### Gallbladder

- Ultrasonography is a sensitive primary examination in biliary diagnostics: in cholelithiasis and in cholecystitis
- Cancer of the gallbladder cannot be ruled out by ultrasonography.

#### Urinary Bladder and Prostate

- Investigation of haematuria, diagnosis of urinary retention
- Residual urine after voiding (see pictures 1 & 2 in the original guideline document) (See also the related Finnish Medical Society Duodecim guideline on "Determining the Volume of Residual Urine by Ultrasonography")
- Size of the prostate (see picture 3 & 4 in the original guideline document), prostatic nodules
- Preparations: the patient should have a full bladder during the examination.
- Transrectal ultrasonography of the prostate is a basic examination by urologists in the assessment of prostatic disease.

#### Pelvic Ultrasonography and Ultrasonography During Pregnancy

- See the related Finnish Medical Society Duodecim guidelines and "Gynaecologic Ultrasound Examination" and "Ultrasound Scanning During Pregnancy."

#### Ultrasonography of Blood Vessels

##### Aorta

- Aortic aneurysm and dissection. An aneurysm larger than 3 cm in size warrants follow-up and a size over 5 cm requires consideration of operative treatment.

##### Vascular Prostheses

- Surgical complications: haematoma, aneurysm or abscess

## Compression and Doppler Examination of the Lower Extremities

- Arterial obstruction and occlusion of the lower extremities (Koelemay et al., 1996) [B]
- Deep venous thrombosis of the femoral and popliteal veins (Kearon et al., 1998) [B] (See also the related Finnish Medical Society Duodecim guideline, "Deep Vein Thrombosis."). Ultrasonography is insensitive in the examination of calf veins (Wells et al., 1995) [A].
- The function of superficial veins can be assessed when planning surgery for varicose veins.

## Carotid Arteries

- Carotid stenosis, follow-up after endarterectomy
- A stenosis of more than 50% with either measurement or flow criteria is usually considered as haemodynamically significant.

## Thoracic Ultrasonography

### Pleural and Pericardial Cavity

- Suspected pleural or pericardial effusion
- Echocardiography (by cardiologists)--see related Finnish Medical Society Duodecim guideline on "Echocardiology"

## Thyroid and Parathyroid Ultrasonography

- Primary examination of a thyroid nodule
- No preparations are needed.

## Soft Tissues and Joints of the Extremities

- Assessment of the need of surgical treatment for muscle and tendon injuries (e.g., rotator cuff, Achilles tendon, patellar tendon)
- Baker's cyst, bursal fluid, peritendinitis
- Diagnosis of synovitis
- Confirmation of the diagnosis of a ganglion
- A limp or hip pain in children (effusion of the hip joint)

## Maxillary and Frontal Sinuses

- Diagnosis of sinusitis, follow-up the therapy
- See related Finnish Medical Society Duodecim guideline on "Diagnosis of Sinusitis"

## Testis and Epididymis

- Enlarged or painful scrotum (differential diagnosis of testis torsion and epididymitis, varicocele, hydrocele, spermatocele, scrotal hernia, haematoma, or contusion)
- Always when testicular tumour is suspected

- Investigation of male infertility

### Ultrasonographically Guided Biopsies and Punctures

- Pleural fluid and ascites
- Evacuation of cysts, haematomas and abscesses
- Detecting and locating synovial fluid facilitates diagnostic aspiration especially from elbow, ankle and wrist joints. If the patient is afraid of the puncture, locating the fluid with ultrasonography usually ensures that the procedure is successful at first attempt.
- Cytological and histological specimens of suspected tumours (e.g. breast, thyroid gland)

### Ultrasonographic Examinations by General Practitioners

- Ultrasonography is a dynamic examination that must be interpreted during the examination. The interpretation cannot usually be reliably performed from printouts afterwards.
- A doctor performing ultrasonographic examinations should be trained by a specialist.
- Some ultrasonographic examinations are suitable to be performed by any doctors, and some for non-radiologists with a special training.
- A positive finding is significant (be careful not to harm the patient with false positive findings): a negative finding in ultrasonography performed by an inexperienced examiner should not be used to rule out a treatable disease.

### Any Doctor Can Perform the Following Examinations after Local Training

- Determination of the size and position of a fluid cavity before puncture (urinary bladder, pleural space, ascites, abscess, synovial fluid)
- Determination of residual urine volume and size of the prostate (see related Finnish Medical Society Duodecim guideline "Determining the Volume of Residual Urine by Ultrasonography") when planning pharmacotherapy for prostatic hyperplasia.

### A Doctor with Special Training for Ultrasonography Can Perform the Following Examinations

- Search for gallstones and signs of acute cholecystitis (thickened gallbladder wall, positive sonopalpation) in a patient with upper abdominal pain
- Search for hydronephrosis or dilated urinary tract in patient with urinary symptoms
- Diagnosis or exclusion of abdominal aortic aneurysm
- Detection of pericardial effusion
- Detection of ascites or intra-abdominal bleeding (e.g. in a patient with mild, blunt abdominal trauma that does not require referral on the basis of the history or clinical presentation)
- Estimation of the size of the spleen (a length exceeding 10-12 cm can be considered abnormal)
- Detection of a hydrocele
- Differentiation between a fluid collection or abscess from other subcutaneous masses (confirmation by puncture can be performed after ultrasonography)



- Some ultrasonographic examinations during pregnancy (see related Finnish Medical Society Duodecim guideline "Ultrasound Scanning during Pregnancy")

#### Related Evidence

- Compared with the landmark technique for placement of internal jugular and subclavian central venous catheters, ultrasound guidance significantly increases the probability of success and reduces the number of complications (Randolph et al., 1996) [A].

#### Definitions:

#### Levels of Evidence

- Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
- Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
- Limited research-based evidence. At least one adequate scientific study.
- No research-based evidence. Expert panel evaluation of other information.

#### CLINICAL ALGORITHM(S)

None provided

### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Concise summaries of scientific evidence attached to the individual guidelines are the unique feature of the Evidence-Based Medicine Guidelines. The evidence summaries allow the clinician to judge how well-founded the treatment recommendations are. The type of supporting evidence is identified and graded for select recommendations (see the "Major Recommendations" field).

### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

#### POTENTIAL BENEFITS

Appropriate use of ultrasonography for diagnosis and evaluation of a variety of clinical conditions

#### POTENTIAL HARMS

False positive or false negative findings have the potential to harm the patient.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

### IOM DOMAIN

Effectiveness

## IDENTIFYING INFORMATION AND AVAILABILITY

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### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2000 Apr 18 (revised 2007 Jan 11)

### GUIDELINE DEVELOPER(S)

Finnish Medical Society Duodecim - Professional Association

### SOURCE(S) OF FUNDING

Finnish Medical Society Duodecim

### GUIDELINE COMMITTEE

Editorial Team of EBM Guidelines

### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Primary Authors: Editors

#### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

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#### GUIDELINE AVAILABILITY

This guideline is included in "EBM Guidelines. Evidence-Based Medicine" available from Duodecim Medical Publications, Ltd, PO Box 713, 00101 Helsinki, Finland; e-mail: [info@ebm-guidelines.com](mailto:info@ebm-guidelines.com); Web site: [www.ebm-guidelines.com](http://www.ebm-guidelines.com).

#### AVAILABILITY OF COMPANION DOCUMENTS

None available

#### PATIENT RESOURCES

None available

#### NGC STATUS

This summary was completed by ECRI on August 28, 2001. The information was verified by the guideline developer as of October 26, 2001. This summary was updated by ECRI on December 9, 2002, April 2, 2004, February 18, 2005, and on February 26, 2007.

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Date Modified: 10/22/2007